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## THE MILKY WAY AS THE ULTIMATE EXTRAGALACTIC SOURCE

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### Abstract

The GAIA satellite will observe the Galaxy and its closest satellites in great detail. This should allow (i) dating past events of dwarf galaxies merging or interacting with the Galaxy, and much improved orbital parameters of the nine dwarf spheroidals and the Magellanic Clouds and (ii) dating of active galactic nucleus (AGN) phases of the Galaxy several Gigayears in the past, by detecting coeval star formation (e.g. open star clusters) that occurred along kpc scale Galactic jets. Both predictions (i) and (ii) of past history will be highly valuable for searching for or excluding topologically lensed images of the Milky Way at high redshift.

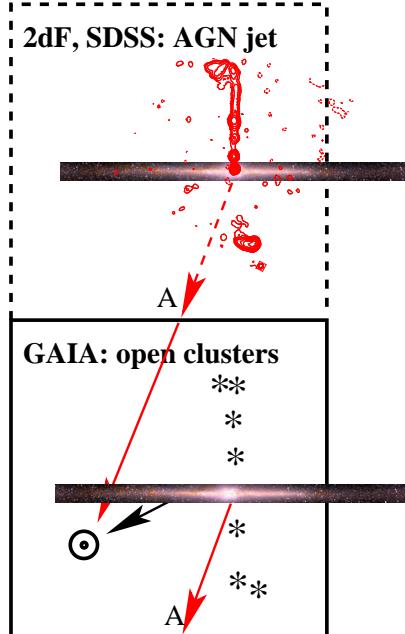
One of the most exciting goals of extragalactic research, to which the GAIA satellite may provide the key, will be to try to detect the Galaxy *as an extragalactic object*, due to topological lensing by the global geometry of the Universe (assuming a perturbed Friedmann-Lemaître hot big bang cosmological model).

For a recent classification and reference list of observational methods and preliminary results in constraining the global geometry of the Universe, see Roukema (2001). For the specific goal of finding topological images of our Galaxy, see Wichoski (2000).

For several decades to come, the most systematic “high” redshift ( $0.5 < z < 3$ ) catalogues of “extragalactic” objects will remain those of quasars. Although (i) GAIA’s dating of dwarf galaxy merger/interaction events will help in the search for extragalactic images of the Galaxy, (ii) GAIA’s dating of AGN phases several Gigayears in the past, e.g. by detecting open clusters formed along kpc scale Galactic jets, will be highly valuable for either finding or excluding the possibility of an extragalactic quasar image of the Galaxy. (The young stars a few million years old at the galactic centre would only be useful if the size of the Universe were about a Mpc, which is clearly not the case!)

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**Fig. 1.** For clarity, an exaggeratedly small toroidal universe, about 16kpc in size, is shown; COBE constraints indicate that the real Universe's size is about  $1h^{-1}$  Gpc or greater (Roukema 2000). The solid outline (lower square) includes the entire physical Universe (fundamental polyhedron); the dark arrow shows the geodesic to the observer at the Sun. The dotted outline (upper square) shows a topological image of the universe, in apparent space; the gray arrow shows the (long time delay) geodesic from this “high” redshift (early epoch), extragalactic, AGN phase image of the Galaxy, with a double lobe jet  $\sim 16$ kpc in full length. In the Galactic image of the Galaxy, open star clusters are shown by asterisks following the shape of the “high” redshift jet, though in reality, they would probably have been through several orbits since the AGN phase during which they formed.

## References

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 Roukema, B.F. 2001, proceedings of the Marcel Grossmann IX Conference, eds Ruffini et al. (arXiv:astro-ph/0010189)  
 Włoszczowski, U. 2000, in proceedings of the Cosmic Topology in Paris 1998 workshop, arXiv:astro-ph/0010170